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Abstract Submission Form

Title (Mr./Mrs/Dr./Prof.) Dr.

Presenting author Maria Frizzarin

Institute

Institute/company: Teagasc

Adress: Moorepark west

ZIP/Postal code: P61 C996

City: Fermoy, Co. Cork

Country: Ireland

Insert all authors and institutions

Frizzarin M. (1), Lahart B. (1), and Berry D.P. (1)

(1) Teagasc, Animal & Grassland Research and Innovation Centre, Moorepark, Fermoy, Co. Cork, Ireland

Preferred presentation Oral Poster

Preferred session Session 8: Global challenges in measuring methane in ruminants

Email of corresponding author maria.frizzarin@teagasc.ie

Title of your paper Validation of previously developed methane emission prediction model using individual Irish cow milk mid-infrared spectra

Insert ABSTRACT text

The agricultural sector in Ireland contributes 38.4% of total greenhouse gas emissions and 71.2% of the agriculture greenhouse gases is generated from methane associated with livestock production. Mid-infrared (MIR) spectral data, which are routinely collected and quantified in a fast, cheap, and non-disruptive way, have been used to predict individual cow methane emissions in Canada, Belgium, France, Netherlands, and Ireland. The objective of this study was to validate, using data from the 2023 calendar year, predictions of enteric methane from milk MIR developed in Ireland based on data from the years 2020 to 2022.The Irish prediction model was developed using 93,888 individual spot measures of methane (i.e., individual samples of animal's breath when using a GreenFeed technology) from 277 cows. The enteric methane phenotype was based on the average of at least 20 individual spot measures taken over a 6 day period surrounding each side of the milk sample with an associated milk spectral data. Predictions used a neural network algorithm that was populated with data on the MIR spectra, milk yield, and days in milk; the correlation between the actual and the predicted values per validation stratum in that 2020 to 2022 data varied from 0.68 to 0.75 in cross-validation, and from 0.55 to 0.71 in leave-one-experiment treatment-out validation. The validation dataset used in this study for the 2023 calendar year

consisted of 45,196 individual cow spot methane measures from 157 cows which were collapsed into 1,715 methane records with associated milk MIR; none of the cows in the validation population were in the dataset to develop the predictive model. The correlation between the real and the predicted values, the root mean square error (RMES), and the ratio of performance to deviation were 0.38, 79.76 g/d, and 0.69, respectively. The validation dataset was then stratified by estimated daily methane as the highest 10% emitting cows and the lowest 10% emitting cows. The mean actual methane emitted by the cows estimated to be the highest 10% emitter cows was 417.39 g/d, while that of those estimated to be the lowest 10% emitters was 220.56 g/d; the respective predicted mean methane of those two groups of animals was 402.59 g/d and 358.26 g/d, respectively. Results from the present study indicated a relatively poor prediction accuracy in estimating individual cow methane emissions in a subsequent year. Nonetheless, differences in the actual mean methane between groups of cows predicted to be divergent in methane materialised. Hence, while individual animal predictions was poor, group predictions materialised.

Enter keywords methane, mid-infrared spectroscopy, pasture based, validation